WATER POLLUTION SURVEY
OF THE
POLICE VILLAGE OF
ST. EUGENE
TOWNSHIP OF
EAST HAWKESBURY
COUNTY OF PRESCOTT

1977

Ministry
of the
Environment

Ontario

WATER POLLUTION SURVEY

OF THE

POLICE VILLAGE OF ST. EUGENE

TOWNSHIP OF EAST HAWKESBURY

- 1977 -

Prepared by:

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I N D E X

A P P E N D I C E S

INTRODUCTION

Staff from the Municipal and Private Abatement Section of the Southeastern Ontario Regional Offices of the Ministry of the Environment completed a Municipal Pollution Survey of the Police Village of St. Eugene during the months of June and August, 1977. This survey was primarily undertaken to update data collected in a survey conducted by Ontario Water Resources Commission staff in 1972. The Police Village was visited on June 13, 1977, and August 18, 1977, with a view to securing data for this municipal study, interviewing municipal personnel responsible for administering the services and collecting water samples to establish the quality of land drainage from various ditches, sewer outfalls, and streams within the limits of the Police Village.

The following people were interviewed during the course of the survey:

1. R. Brunette, Clerk-Treasurer,
   Township of East Hawkesbury.

2. R. Quesnel, Secretary-Treasurer,
   Board of Trustees,
   Police Village of St. Eugene.

3. Mr. R. Leblanc, Senior Health Inspector,
   Eastern Ontario Health Unit,
   L'Orignal, Ontario.

PREVIOUS RECOMMENDATION

Previous surveys were conducted by the Ontario Water Resources Commission in 1962 and 1972. These reports contained the recommendation: "that the Village of St. Eugene should take steps to initiate a program for the detection and elimination of contaminated sewage discharge to a tributary of the Rigaud River from the Police Village of St. Eugene without further delay."

GENERAL

The Police Village of St. Eugene is situated in the north-east section of the Township of East Hawkesbury, approximately 10 miles east of the Town of Vankleek Hill. The village was essentially developed on an east-west axis along a section of County Road 13.

The population of this community is about 473 and has changed little in the past fifteen years. There is no industry in this rural community aside from

a few commercial establishments, including small retail outlets and a feed mill. St. Eugene is largely residential, and it is presumed that most of the residents are pensioned or retired.

TOPOGRAPHICAL AND GEOLOGICAL CONDITIONS

The Village of St. Eugene is located on a relatively flat plain, and is underlain by a clay soil, commonly known as the "Bearbrook" series. The Ottawa limestone formation underlies most of the study area, and consists mainly of grey limestone with some dolomite shale and sandstone in the lower parts. These rock formations consist principally of horizontal beds of limestone and dolomite that outcrop most prominently along the Ottawa River. The influence of this bedrock on the drainage and physiography of the region is considerable. The Bearbrook series are clay textured soils, which possess poor natural drainage. The soil profile possesses the sequence of alternating bands of red and grey clay.

The Uplands series are the well-drained soils that occur on fine sand deposits. These sand deposits are non-calcareous and deep. The sandy deposits have uniformly fine particles. These soils are located largely to the south and east of the Village.

The Rubicon series are imperfectly drained soils associated with the uplands series. In these locations, the soil is often saturated to the surface for several months of the year. In many of these locations, a fairly thick iron pan layer develops that is soft during the periods when the soil is wet, but during the summer months becomes very hard and impermeable. This iron pan layer, when present, occurs at a depth of about ten inches.

SEWAGE DISPOSAL

In most instances, sewage wastes are directed to subsurface septic tank disposal systems. It was found, however, through Ministry surveys, and a recent one conducted by the Eastern Ontario Health Unit, that the wastes are generally directed to the storm sewer network because of the inability of the soil in the area to adequately absorb and attenuate septic tank effluents.

As mentioned previously, both the Bearbrook and the Rubicon series exhibit poor natural drainage, and therefore are generally not suitable for subsurface tile absorption fields.

WATER SUPPLY

Water for domestic purposes is obtained from individual well supplies. In a recent report prepared by the Eastern Ontario Health Unit, it was established that 38% of all well samples collected indicated some degree of contamination.

LAND DRAINAGE

The existing drainage network consists largely of open ditches, although some parts of the main street are serviced by storm sewers. These sewers have their outlets into a tributary of the Rigaud River.

The surface water samples collected during this survey indicated that runoff within this village carries a great deal of contaminating substances. These results are shown in Tables 1 and 2 of the appendix. It was also noted in the report by the Eastern Ontario Health Unit that approximately 75% of the village residents were connected to this storm sewer system.

SANITARY SURVEY

In February and March 1977, a door-to-door survey was conducted in St. Eugene by the Eastern Ontario Health Unit at the request of the Township of East Hawkesbury. The purpose of this survey was to evaluate the extent of contamination in individual water supplies and to determine the adequacy of existing sewage disposal systems.

A total of 113 homes were visited, and the occupants were interviewed. Information was gathered regarding the type of wells and their depth, in addition to the sewage systems serving the dwelling.

A summary of the survey results was reported to Mr. R. Brunette, Clerk of the Township of East Hawkesbury, in a letter dated May 30, 1977, from the Eastern Ontario Health Unit. The results of this survey indicated that approximately 75% of the village residents were connected to the storm sewer system, and it was noted that correction of these problems were extremely difficult because of the following facts:

(a) The existing lot sizes and shapes do not conform to the present-day requirements.

(b) Most existing houses would require sewage pumps to feed the partially raised leaching beds, which would be required in most instances.

(c) The existing soil condition is predominantly Bearbrook clay.

(d) The groundwater table is located about 3 feet from the ground surface.

(e) Many homes are located at the sidewalk's edge, and the private water supply at the back of the property.

The summary also indicated that at least 38% of the water samples were contaminated. The report suggested that wells that were not able to yield potable water should have some form of water purification or periodic disinfection measures.

WATER POLLUTION SURVEY

Results and Interpretation

Water samples were collected at the various locations throughout the police village and analysed for bacteriological and chemical contaminants. The sampling points are indicated on the map accompanying this report, and further outlined in detail below. The results are tabulated in Tables 1 and 2 in the attached appendix.

A total of 14 samples were collected from 6 locations. Samples were bacteriologically examined at the Ministry of the Environment laboratory using the Membrane filter method (Appendix II). The chemical samples were also analysed at the Ministry laboratory.

The results of the laboratory analyses and discussions of the meaning of the results are appended to this report as follows:

Appendix I - Significance of Bacteriological Examinations
Appendix II - Membrane Technique
Appendix III - Bacteriological Sample Results
Appendix IV - Significance of Chemical Analyses
Appendix V - Chemical Sample Results

A description of the major sampling stations and amounts on the results of

samples collected at these stations are as follows:

1 - Main Street East (Samples 101-101D)

- At this location, samples were collected both from the sewer outfalls and the stream channel upstream and downstream. The bacteriological counts were extremely high on all samples, with the possible exception of the sample taken 50 feet downstream from this point. In addition, the chemical sample results from the outfalls showed high BOD and suspended solids. This would indicate that domestic sewage is being discharged to the sewer. The stream chemical results, however, did not show any extreme values.

2 - Street "A" (Samples 102-104)

- At this location, samples collected from the sewer outfalls indicated very high results, both bacteriologically and chemically. Again, this showed that sewage was entering the stream from the storm sewer network. The stream values in both instances indicated moderately high bacteriological counts.

3 - Street "B" (Samples 105 and 106)

- Here, the samples from the storm sewer outfall were high, as in the previous locations. The chemical and bacteriological results of samples collected from the stream at this point show the adverse effects of sewage discharges to the stream at this location.

4 - Street "C" (Samples 107-109)

- As in the case of the previous locations, the sample results from the outfalls were very high, both bacteriologically and chemically. The water quality of the stream at this point was considered reasonably good.

5 - Upstream (CPR Bridge) Sample 110)

- The chemical and bacteriological quality of the stream was considered good at this location.

6 - Main Street West Ditch (Sample III)

- The results from this sampling indicated very high bacteriological counts and chemical concentrations, which would indicate sanitary waste was gaining access to the ditch.

Summary of Results

All of the samples collected from the storm sewer outfalls and ditches indicated extremely high coliform counts. The chemical analyses generally indicated that the BOD_5 and suspended solids concentration were also very high, particularly those taken from all storm sewer outfalls.

The bacteriological sample results clearly illustrate degradation of water quality from the upstream to the downstream side of the community. These results then reinforce the conclusions of the report prepared by the Eastern Ontario Health Unit - that domestic waste is gaining access to the storm sewer and storm ditch system. Elimination of these discharges to the sewer network and proper waste disposal systems should resolve the pollution in the receiving stream.

CONCLUSION AND RECOMMENDATION

Investigations have been made by Ontario Water Resources Commission staff, both in 1962 and in 1971, to assess the unsanitary conditions and the associated pollution of the public watercourse within the boundaries of the Police Village of St. Eugene. Both these surveys indicated that sewage wastes are being discharged to a local watercourse and subsequently deteriorating the water quality of this stream. Further investigations of this same watercourse in June and August of this year (1977) by staff from the Ministry of the Environment, Cornwall district office, have revealed that the situation was unchanged. Sewage wastes were continuing to be discharged to the stream and the quality of the watercourse was further degraded.

Therefore, it is concluded that the municipality should initiate action to develop a sewage works project to eliminate contamination of the local watercourses.

APPENDIX I

SIGNIFICANCE OF BACTERIOLOGICAL EXAMINATIONS

Total coliform organisms include a wide variety of bacteria ranging from the genus (group) Escherichia Coli (E. Coli), which originate mainly in the intestines of man and other warm-blooded animals, to the genera Citrobacter and Enterobacter aerogenes. The latter genera are basically found in soil, but are also present in feces in small numbers. The presence of total coliforms in water may indicate soil runoff or, more importantly, less recent fecal pollution, since organisms of the Enterobacter-Citrobacter groups tend to survive longer in water than do members of the Escherichia Coli group, and even to multiply when suitable environmental conditions exist.

The Fecal Coliform organisms are those coliform bacteria that are of intestinal origin, and therefore, are an indicator of recent fecal pollution. Most of the coliform bacteria found by the fecal coliform test are of the genus, Escherichia Coli.

Fecal Streptococci organisms are normal inhabitants of the large intestine of man and animals, and generally, do not multiply outside the human body. In waters polluted with fecal material, fecal streptococci are usually found along with fecal coliform bacteria, but in smaller numbers. When the number of fecal streptococci bacteria approximates or is greater than the number of fecal coliform organisms, animals are the probable source.

The Ministry of Environment Guidelines for Water Quality Management in Ontario (1974), indicate that water used for total body contact recreation can be considered impaired when the total coliform, fecal coliform and/or fecal streptococcus geometric mean density exceeds 1000, 100, and/or 20 per 100 ml.

APPENDIX II

MEMBRANE FILTER TECHNIQUE

A filtration technique for enumerating coliform bacteria in water was developed during the early 1940's. It has been accepted as a standard for the sanitary quality of water. A portion of the sample is passed through a cellulose acetate filter membrane of such porosity as to retain bacteria while permitting the water to pass through freely. The filter membrane is then placed aseptically in a Petri dish on an absorbent pad saturated with a differential nutrient solution, such as M-Endo broth (buffered lactose-peptone-salts with bile salts and decolorized basic fuchsin) and incubated at 35°C. for 20 hours. The membrane is then examined by low-power microscopy, and purplish green colonies with a metallic sheen are counted. These are considered to be coliform bacteria.

The amount of sample to be filtered varies according to the nature of the specimen: 100 to 500 ml. of finished, municipal water may be examined, whereas 0.1 to 10 ml. of well water may yield 20 to 80 coliform colonies (the recommended density for most accurate counting). Greater precision is possible by the membrane filter technique than by the multiple lactose tube method of estimating coliforms, because larger volumes of samples can be examined, and results are secured more quickly. The method is limited, however, by the clogging of the filters with algae, colloidal and other materials, and by the inhibition of coliforms in specimens containing excessively high, noncoliform populations.

APPENDIX III

BACTERIOLOGICAL ANALYSIS

VILLAGE OF ST. EUGENE

WATER POLLUTION SURVEY

1977

TABLE 1

DATE	SAMPLE NO.	LOCATION	TOTAL COLIFORMS (per 100 ml)	FECAL COLIFORMS (per 100 ml)	FECAL STREPTOCOCCUS (per 100 ml)
June 13	101	Main Street Southeast Sewer Outfall	*G 240,000,000	195,000	**L 10
Aug. 18	101	"	G 15,000,000	150,000	L 1000
June 13	101A	Main East North Side 50' Downstream	2,500	32	4
Aug. 18	101A	"	21,000	210	190
June 13	101B	Main East South Side 50' Upstream	100,000	1,280	L 4
Aug. 18	101B	"	9,000	340	170
June 13	101C	No sample collected			
Aug. 18	101C	No sample collected			
June 13	101D	Main East Sewer Outfall North East side	G 15,000,000	76,000	L 100
Aug. 18	101D	"	G 150,000	G 1,500	90
June 13	102	Street "A" Sewer Outfall East Side	99,000,000	130,000	L 100
Aug. 18	102	"	G 150,000,000	G 150,000	35,000
June 13	103	Street "A" Creek Sample	34,000	104	420
Aug. 18	103	"	G 15,000	5,000	1,300
June 13	104	Street "A" Sewer Outfall West Side	830,000,000	1,100,000	1,770,000
Aug. 18	104	"	G 150,000,000	G1,500,000	610,000

BACTERIOLOGICAL ANALYSIS

VILLAGE OF ST. EUGENE

WATER POLLUTION SURVEY

1977

DATE	SAMPLE NO.	LOCATION	TOTAL COLIFORMS	FECAL* COLIFORMS	FECAL STREPTOCOCCUS
June 13	105	Street "B" Sewer Outfall Southwest side	5,000,000	490,000	24,000
Aug. 18	105	"	42,000	11,000	L 1,000
June 13	106	Street "B" Creek Sample	14,200	960	48
Aug. 18	106	"	39,000	3,700	140
June 13	107	Street "C" Sewer Outfall Southeast side	228,000,000	710,000	L 1,000
Aug. 18	107	"	G 15,000	G 1,500	G 1,500
June 13	108	Street "C" Sewer Outfall Southwest side	170,000,000	1,700,000	L 1,000
Aug. 18	108	"	G 15,000,000	G 150,000	35,000
June 13	109	Street "C" Creek Sample	1,500	92	80
Aug. 18	109	"	G 15,000	G 1,500	560
June 13	110	C.P.R. Bridge Creek Sample	288	104	24
Aug. 18	110	"	G 150,000	G 15,000	10,100
June 13	111	City Road Creek Sample	14,000,000	65,000	L 1,000
Aug. 18	111	"	30,000,000	G 15,000,000	G 15,000

* G = Greater than
** L = Less than

APPENDIX IV

SIGNIFICANCE OF CHEMICAL ANALYSES

Biochemical Oxygen Demand (BOD)

The biochemical oxygen demand (BOD) of domestic and industrial waste waters is the amount of molecular oxygen required to stabilize the decomposable matter present in a water by an aerobic biochemical action. Since it is impractical in actual work to utilize tests that require more than a few days for reliable results, it is customary to make BOD tests at a standard temperature of 20°C for a 5-day period, which is about 68% of the ultimate, when a reaction velocity co-efficient of 0.10 is used. A high BOD is indicative of organic or chemical pollution.

In most cases, adequate protection for surface waters should be provided if BOD concentrations in waste discharges exceed 15 mg/l, but in some cases, a much higher concentration can be tolerated, while in other cases, a concentration less than 15 mg/l could be detrimental. Special situations have to be examined individually. This will ensure that the biochemical oxygen demand from the various sources, does not lower the oxygen concentration in the watercourse below 6-7 mg/litre and thus make the watercourse acceptable for various fresh water biota.

Suspended Solids

The suspended solids value is the most significant of the solids determination, and indicates the measure of the undissolved solids of an organic or inorganic nature. Organic solids create sludge banks and decompose, causing odours and unsightly conditions. Inorganic suspended solids blanket the stream bed affecting benthos organisms.

The effects of suspended solids in water are reflected in difficulties associated with water purification, decompositions in streams, and injury to the habitat of fish. In most cases, adequate protection for surface waters should be provided if suspended solids concentrations in waste discharges exceed 15 ppm.

Nitrogen

Total Kjeldahl is a measure of the total nitrogenuous matter present except that measured as nitrite and nitrate notrogens. The total kjeldahl less the ammonia

nitrogen measure the organic nitrogen present. Ammonia and organic nitrogen determinations are important in determining the availability of nitrogen for biological utilization. The normal range for Total Kjeldahl would be 0.1 to 015 mg/l.

Phosphorous

This element is commonly found in nature in the form of phosphates (PO_4). Raw or treated sewage, some industrial wastes, and agricultural drainage contain significant concentrations of phosphate. The laboratory provides two phosphorous determinations: Total phosphorous and soluble phosphorous; Total phosphorous includes orthophosphate, polyphosphate and organic phosphorous, while soluble phosphorous represents orthophosphates only.

Phosphorous is an essential nutrient for plant life, and like nitrogen, passes through cycles of decomposition and photosynthesis. Nitrogen and phosphorous are both essential for the growth of algae, and limitation of these compounds controls their growth rate. Generally, soluble phosphorous in concentrations of 0.01 mg/l or greater, at the beginning of the growing season, may cause algae nuisance conditions.

CHEMICAL ANALYSIS

VILLAGE OF ST. EUGENE - WATER POLLUTION SURVEY

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TABLE 2

DATE	SAMPLE NO.	LOCATION	5-DAY BOD	SUSPENDED SOLIDS	TOTAL KJELDAHL	TOTAL PHOSPHORUS	CONDUCTIVITY UMHOS/CM	MBAS
June 13	101	St. Eugene, Main Street Southeast sewer outfall	75	100	8.0	3.0	1200	3.4
Aug. 8	101	"	26		17.8	6.0	1300	
June 13	101A	St. Eugene, Main Street Downstream 50 ft. South	2	15	1.25	.30	405	.1
Aug. 8	101A	"	5		2.1	.420	640	
June 13	101B	St. Eugene, Main Street Upstream, 50 ft. North	2	15	1.0	.30	455	.1
Aug. 8	101B	"	2		.81	.280	570	
June 13	101C	No sample collected						
Aug. 8	101C	"						
June 13	101D	St. Eugene, Main Street, Northeast sewer outfall	40	1300	156	33	1650	0.1
Aug. 8	101D	"	10		8.6	1.96	1700	
June 13	102	St. Eugene, Main Street Street "A", sewer outfall East Side	100	200	120	30	1700	11
Aug. 8	102	"	200		77	13.5	1700	
June 13	103	St. Eugene, Street "A" Creek sample	2	15	2.0	.20	380	0.1
Aug. 8	103	"	3		1.65	.290	550	

CHEMICAL ANALYSIS

VILLAGE OF ST. EUGENE - WATER POLLUTION SURVEY 1977

TABLE 2

DATE	SAMPLE NO.	LOCATION	5-DAY BOD	SUSPENDED SOLIDS	TOTAL KJELDAHL	TOTAL PHOSPHORUS	CONDUCTIVITY UMHOS/CM	MBAS
June 13	104	St. Eugene, Main Street, Sewer outfall, west side	200	380	340	43	1950	9.6
Aug. 8	104	"	300		220	26	2900	
June 13	105	St. Eugene, Main Street Street "B", sewer outfall South-west side	1300	700	225	58	2800	9.4
Aug. 8	105	"	28	2.25	3.45	5.8	1420	
June 13	106	St. Eugene Creek sample Street "B"	5.5	15	2.25	.20	395	.1
Aug. 8	106	"	2		.87	.150	530	
June 13	107	St. Eugene, Street "C", S. East Side - outfall	330	870	180	46	2000	79
Aug. 8	107	"	11		8.5	.940	680	
June 13	108	St. Eugene, Street "C" S. West side - outfall	550	1700	100	23	2000	31
Aug. 8	108	"	85		9.5	6.6	1700	
June 13	109	St. Eugene Creek Sample Street "C"	2	15	.70	.12	355	.1
Aug. 8	109	"	2		2.65	.300	530	

APPENDIX V

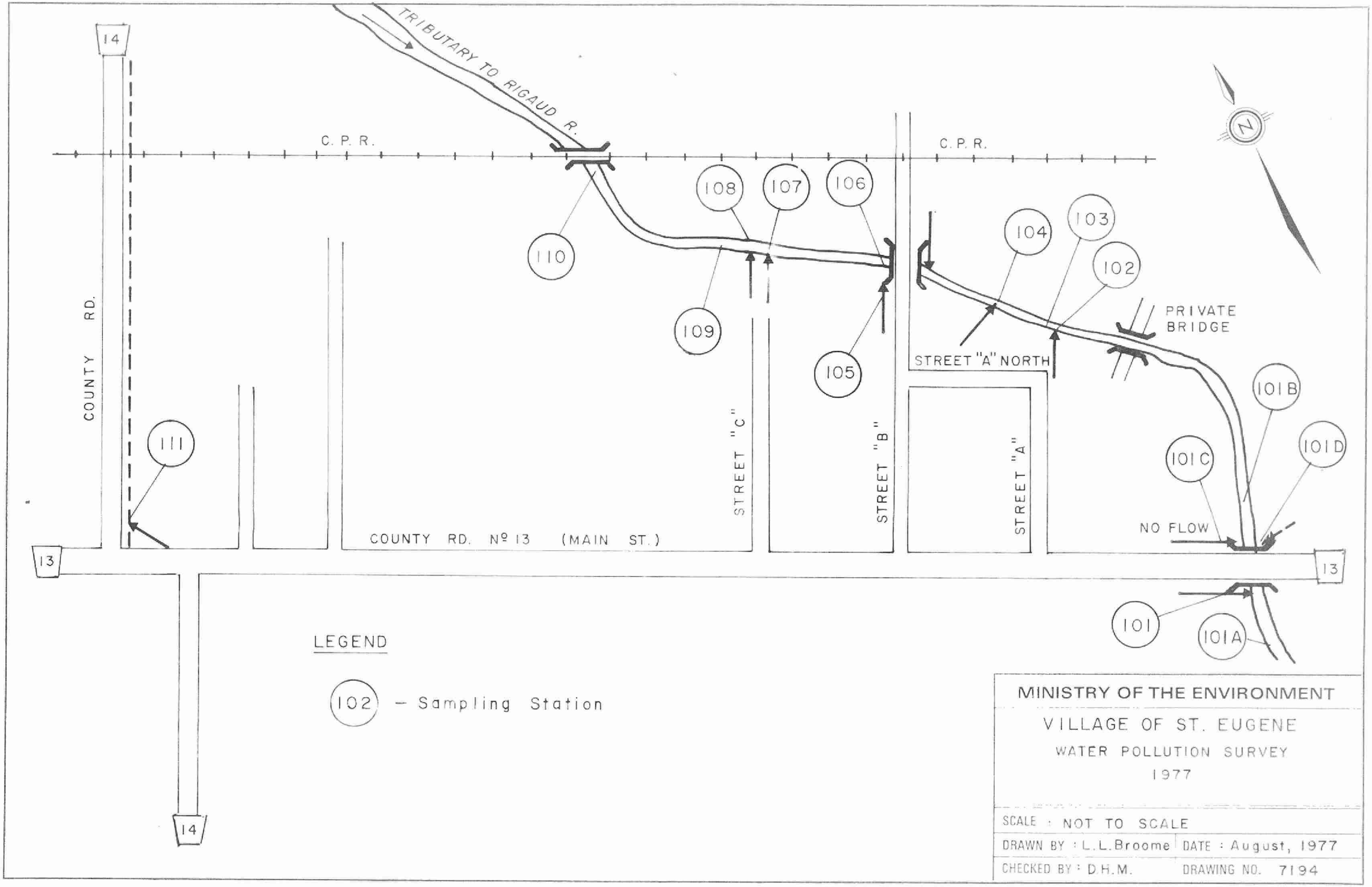
CHEMICAL ANALYSIS

TABLE 2

VILLAGE OF ST. EUGENE - WATER POLLUTION SURVEY

1977

DATE	SAMPLE NO.	LOCATION	5-DAY BOD	SUSPENDED SOLIDS	TOTAL KJELDAHL	TOTAL PHOSPHORUS	CONDUC-TIVITY UMHOS/CM	MBAS
June 13	110	St. Eugene, Creek Sample C.P.R. Bridge	2	15	.65	.14	350	.1
Aug. 8	110	"	6		7	2.2	890	
June 13	111	St. Eugene, Creek Sample Main Street West, City Road	270	700	25	19	2100	20
Aug. 8	111	"	10		4.8	2.1	1320	



TRIBUTARY TO RIGAUD R.
C. P. R.
C. P. R.
14
14
13
13
COUNTY RD.
COUNTY RD. Nº 13 (MAIN ST.)
STREET "C"
STREET "B"
STREET "A"
STREET "A" NORTH
PRIVATE BRIDGE
NO FLOW
101
101A
101B
101C
101D
102
103
104
105
106
107
108
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110
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LEGEND
102 – Sampling Station
MINISTRY OF THE ENVIRONMENT
VILLAGE OF ST. EUGENE
WATER POLLUTION SURVEY
1977
SCALE : NOT TO SCALE
DRAWN BY : L.L.Broome
DATE : August, 1977
CHECKED BY : D.H.M.
DRAWING NO. 7194

Date Due

JUL 14 1978			